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Numerical models of cosmological evolution of a degenerate Fermi-system of scalar charged particles

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Abstract

© 2015, Pleiades Publishing, Ltd. Based on the previously constructed mathematical model of a statistical Fermi system with particle interaction, in this paper we construct and analyze numerical models of cosmological evolution of a single-component degenerate Fermi system of scalar particles. The applied mathematics package Mathematica 9 is used for numerical model construction. It is strictly proved that the conservation law for the total energy of the scalarly charged degenerate Fermi system and a massive scalar field is a differential consequence of the particle number conservation law. Thus the mathematical model of cosmological evolution of the system is reduced to a closed normal set of three essentially nonlinear ordinary differential equations. After transforming the equations to dimensionless variables, an algorithm of its numerical solution is suggested. On the basis of numerical simulation of the cosmological evolution we show the presence of a new phenomenon in the cosmological evolution: it is the phenomenon of phantom bursts of cosmological acceleration at times of the order of 103 Planck times.

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